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TITLE 5

What We Have Accomplished and What's Ahead

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Commonwealth of Massachusetts
Department of Environmental Protection

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January 5, 1995

Dear Reader:

My first assignment when I began my environmental career as a graduate student was to assess the costs and benefits of certain water pollution control investments in Massachusetts. After a few days our project team concluded the task was just too difficult and we moved on to a new project.

Thirteen years later, the cost-benefit job has not gotten any easier. Yet the questions have never been more important.

What's the economic value of avoided illness? Of meeting future needs for clean public water supplies? Of swimming and recreational fishing?

These are some of the questions we have set out to answer in this report that reviews the results of DEP's 1995 revisions to the Commonwealth's septic treatment regulations (commonly referred to as Title 5).

What we have found is that using the most conservative assumptions - that is, answering "zero" to all of the questions above - still demonstrates that Title 5 compliance is smart public policy. Benefits outweigh costs.

Next month we will be issuing a more detailed, technical appendix to this report. The appendix will offer a more quantitative analysis of Title 5 costs and benefits. We will articulate specific assumptions as to the economic value of protected water resources, and we will see how cost-benefit ratios change based on those assumptions.

In the meantime, this conservative approach towards analyzing Title 5 implementation meets the requirements of the state legislature, the interests of DEP, and the needs of the public in knowing that Massachusetts' revised septic system regulations are highly cost effective on a statewide basis.

This exercise has further served to reconfirm my commitment to building up DEP's economic analysis capabilities. Massachusetts' ability to develop and implement effective and efficient environmental programs will be greatly enhanced by examining relative costs and benefits of regulations before new rules take effect.

If you have reactions to this report, I encourage you to share them with us. Please put your comments in writing and send them directly to me. Thanks.

Sincerely,

David B. Struhs
Commissioner



Across Massachusetts, failing cesspools and septic systems are a leading cause of contaminated drinking water, tainted shellfish beds, weed-choked lakes and ponds and polluted beaches. Three years ago, the Department of Environmental Protection began working with key stakeholders to revise the state's septic system rules for the first time since 1978. The revised Title 5 of the State Environmental Code protects the health of Massachusetts citizens and the state's natural resources by requiring inspection of private on-site sewage disposal systems before properties using them are sold, expanded or undergo a change in use.

This report reviews the first nine months of implementation of the 1995 revised Code and previews future plans and expectations. A more detailed quantitative analysis of the costs and benefits of Title 5 will be released as an appendix to this report in February, 1996.

TITLE 5 BENEFITS OUTWEIGH COSTS

DEP's cost-benefit analysis of the new Title 5 rules concludes that the accrued public health and environmental benefits outweigh the costs by a margin of better than five to one. In preparing this analysis, DEP has taken a highly conservative approach, in that the department has not quantified or assigned a dollar value to all of these benefits. *If the full economic value of clean water resources plus avoided illness and health care costs were included, the benefits of the new rules would outweigh the costs by an even larger margin than the figures provided here indicate.* But even with this conservative approach, DEP estimates the benefits of Title 5 total at least \$135.5 million per year, compared to an average annual cost of \$26.3 million.

The cost of Title 5 repairs and upgrades also compares favorably to the cost of sewers. Amortized over 20 years, the total costs associated with the typical Title 5 upgrade are lower than the average sewer bill. In almost every instance, even homeowners who install new septic systems will pay less, on an annualized basis, than most residential sewer ratepayers. And since more than three out of four septic systems *pass* inspection, the only costs for most homeowners are inspection fees and regular maintenance — clearly far more affordable than a sewer bill.

Estimated Costs

Since the Title 5 revisions took effect in March 1995, approximately 26,000 private septic systems and cesspools have been inspected across the state, nearly four times as many inspections as were occurring annually under the

old Code. Fewer than one-quarter (6,500) have needed upgrades, and half of the repairs have involved inexpensive replacement of broken parts. An independent survey of local health boards, financial institutions and system inspectors found that the average cost of a Title 5 upgrade — factoring in all regions of the state and all types of upgrades, from repair of broken parts to replacement of an entire system — has been about \$6,200.

DEP estimates that the 6,500 septic systems repaired, upgraded or replaced since Title 5 took effect handle more than 522 million gallons of household wastewater annually. This wastewater is now being treated at levels that are protective of public health and the environment at an estimated first-year cost, including inspection fees and repair costs, of approximately \$50 million. Amortized over 20 years, the average expected lifespan of a septic system, that works out to less than a penny a gallon. But that cost will go down considerably in subsequent years; the total number of repairs needed each year will decrease as the most troublesome areas are sewered and the backlog of failed systems is reduced. DEP estimates that the total average annual costs over the next ten years will be approximately \$30.4 million per year. Subtracting from that figure the comparable long-term yearly cost of the old Code, estimated at approximately \$4.1 million, yields an average annual cost of the new Title 5 of approximately \$26.3 million per year over the next ten years.

Estimated Costs of Title 5 Regulations (in millions)

	First Year of Implementation	Annual Average 1996 - 2005
Estimated Cost of 1995 Code	\$49.9 (range \$44.6-\$66.0)	\$30.4
Estimated Cost of 1978 Code	\$6.7 (range: \$4.9-\$9.6)	\$4.1
New Cost Attributable to the Revised Code	\$43.2 (range \$39.7-\$56.4)	\$26.3

Estimated Benefits: Reduced Pollution, Avoided Costs, and Job Creation

Commercial Shellfishing: A total of 170,643 acres of shellfish beds are closed to harvesting in Massachusetts. Of these, DEP estimates that 55,685 acres are contaminated to some degree by septic systems.





The potential future benefits associated with reopening these 52,503 acres of shellfish beds are estimated at \$2.6 million per year for additional shellfish landings, and \$28,000 in additional permit revenues. Potential costs avoided due to prevention of future bed closures that might have occurred in the absence of Title 5 are estimated to be of a similar magnitude, yielding an estimated overall benefit of \$5.3 million.

Lakes and Ponds: DEP estimates that 72 percent of the Commonwealth's lakes are affected by eutrophication (depleted oxygen and/or excessive algae and weed growth). This condition, caused largely by excess nutrients, significantly reduces the recreational and aesthetic value of the affected waterbodies. It is estimated that septic system discharges account for at least 14 percent of the nutrient inputs to lakes and ponds statewide, and substantially more in many specific cases. An indirect estimate of the potential benefits associated with better lake and pond water quality attributable to Title 5 was derived using known costs to treat or restore affected lakes. These remediation costs provide an indirect valuation of the potential benefits associated with protecting these water resources. Based on the estimated costs for a mix of maintenance and restoration projects that would be needed to address the impact of septic system discharges on Massachusetts lakes and ponds, DEP estimates \$10.8 million per year in avoided costs due to the new Title 5.



Recreation: Improvements in recreational freshwater fishing and shellfishing in Massachusetts as a result of the new Title 5 will provide an estimated benefit of \$8.1 million per year in increased revenues and avoidance of future costs. Because of a lack of data, the economic benefits associated with other forms of recreational activities, such as swimming, boating, and saltwater fishing, could not be quantified.



Jobs: The upgrading of septic systems and cesspools will generate significant economic activity and jobs. Although technically not a direct benefit, the money spent will benefit the local economy in two ways: the regulations have already stimulated the development and sale of innovative technologies by companies based in Massachusetts, spurring the growth of "green" businesses; and, the dollars spent on system upgrades are spent in Massachusetts, even by those selling their homes and moving out of state. In these cases, the Commonwealth benefits twice; the dollars spent provide local jobs, and the upgraded septic systems improve the overall quality of our environment.

The revised Title 5 will continue to create jobs for system designers, system installers, soil evaluators, inspectors, and workers involved with supplying

materials such as concrete septic tanks. DEP estimates that approximately 442 new jobs will be created, generating total wages of approximately \$15.9 million dollars annually.

Public Health: Based on data from the U.S. Food and Drug Administration, DEP estimates that 253 people in Massachusetts become sick every year after eating septage-contaminated shellfish. Additional illnesses caused by contaminated ground and surface drinking water supplies undoubtedly also occur, but there simply is not enough data available to estimate the numbers.

Nationally, septic leachate is the most commonly reported cause of contaminated groundwater drinking water supplies. The consumption of untreated groundwater was responsible for almost half of all cases of water-borne disease in the U.S. from 1971 to 1979. A similar situation is likely to exist here. Thus, although there is not enough public health data to accurately estimate the number of septage-related diseases in our state, the number is likely to be significant. Contamination of groundwater by chemicals associated with septage, most notably nitrates, is well documented across Massachusetts, with nitrate levels on the increase in public water supplies serving tens of thousands of people. Less well-documented are nitrate levels in private drinking water wells that serve many thousands more.

While it is difficult to accurately estimate the potential avoided costs of decreased pollution of drinking water, it is clear that the benefit will be substantial. For example, the cost of a filtration plant for the Wachusett Reservoir alone would be some \$400 million — or about \$20 million per year over 20 years. The technical appendix to this report to be released next month will examine these costs more closely.

Sewering: As stated earlier, the cost of upgrading and maintaining a conforming Title 5 system is far less than the cost of sewers. Based on the cost of sewerage neighborhoods with failed septic systems around the Wachusett Reservoir, DEP estimates that the cost of replacing failed septic systems with sewers statewide would be a minimum of \$75 million dollars per year.

Rivers: Septic systems are believed to directly contribute to the contamination of approximately 926 Massachusetts river miles, reducing the recreational and aesthetic value of these waterways. The dollar value of these impacts cannot be quantitatively determined and are not included in this cost-benefit analysis. The technical appendix to this report to be released next month will further consider these values.



Failed Systems Threaten Public Health

- High levels of nitrates in drinking water can be toxic to babies. At least 61 public water supply sources in Massachusetts report nitrate levels that already exceed 5 parts per billion (ppb), more than half the public health standard of 10 ppb. The cost of building and operating treatment facilities for all these wells would be approximately \$495 million over twenty years.
- The town of Weymouth suspects leaking septic tanks and cesspools contributed to recent bacterial contamination in town water supplies, and has urged 28 property owners to connect to the municipal sewer system.
- In Westfield, contamination from failing septic systems was identified as the cause of contamination in the Hampton Ponds, a popular swimming area. The city is now working to extend sewer lines to the neighborhood.

Comparison of Benefits To Costs

Sharing the Solution

- In Rowley, seven failed residential cesspools will be replaced by a shared septic system operated by the town — a solution that is available as a direct result of the Title 5 revisions. All of the homes to be served are owned by low- or moderate-income families who could not afford individual replacement systems. The shared system will also enable the town to reclaim a municipal building that was closed due to a septic system failure. The building will probably be used as a senior center or library.
- In Duxbury, a wastewater district is being formed to build a town-operated shared system to serve approximately 30 commercial establishments in Snug Harbor, all of which currently have failing septic systems. A smaller shared system that would serve three properties in the Bluefish River section of town is also under consideration.

The considerable uncertainty in the benefit estimates and the time frames over which those benefits will accrue, and the inability to accurately place dollar values on several important benefits, make a comprehensive comparison of Title 5 costs and benefits difficult. The estimates that DEP has been able to derive, however, suggest that long-term benefits potentially attributable to Title 5 significantly outweigh the costs involved.

The best estimate for total average yearly costs associated with Title 5 (averaged over ten years) is approximately \$30.4 million. Approximately \$4.1 million of this total can be attributed to expenditures that were occurring before the revised code took effect (i.e. they had to be made even under the 1978 code), yielding a new cost of \$26.3 million per year attributable to the 1995 revisions. Expenditures are up chiefly because a greater percentage of polluting septic systems are being identified and repaired.

The best estimate of quantifiable potential future benefits attributable to the new Title 5 equals approximately \$135.5 million per year — more than five times the estimated annual cost. As these benefits will not occur immediately but will accrue over an extended period, *and will continue beyond the ten-year time-frame considered in the cost estimations*, this longer-term comparison is the most appropriate. DEP's positive benefit ratio is highly conservative because many important benefits could not be quantified in dollar terms and because the yearly costs of implementing Title 5 in the future are likely to be less than those estimated. Another long-term economic benefit is the fact that many of the inexpensive repairs happening now will head off more expensive repairs later.

MASSACHUSETTS TAKES A LEADERSHIP ROLE IN INNOVATIVE AND ALTERNATIVE TECHNOLOGIES

One of the biggest successes of Title 5 is its new streamlined approval process for innovative and alternative technologies for on-site wastewater treatment. These systems provide substitutes for, or alternatives to, one or more of the components that make up a conventional system, while providing equal or better environmental and public health protection. These can be used for cost-effective upgrades on sites that cannot accommodate conventional systems, in environmentally sensitive areas, or where conventional systems simply don't work. More than 20 alternative systems have been approved in Massachusetts, and at least 20 more are currently under review. *No other state in the nation has approved more innovative technologies.*

Estimates of Title 5 Benefits (Including Annual Avoided Costs)¹

	Best Estimate**	Range
Shellfish Landings: potential opening of beds currently closed and prevention of future deterioration	\$5,330,800	\$287,000 - \$10,661,600
Shellfish Permits	\$27,900	\$3,200 - \$55,800
Impacts to Lakes and Ponds	\$10,810,000	\$52,200 - \$73,865,100
Additional Sportfishing Expenditure Impacts	\$8,063,400	\$7,701,200 - \$98,760,580
Employment Impacts	\$15,940,000	NI - \$21,083,000
Other Recreational Impacts: boating swimming, etc.	N/A (moderately significant)	N/A
Drinking Water Benefits associated with preventing water supply contamination and resulting need to treat	\$20,000,000 (minimum)	\$20,000,000 +
Public Health Impacts	N/A (approximately 253 cases per year of shellfish poisoning and a significant but unquantifiable number due to drinking water contamination are likely to be prevented)	N/A
"Existence Value"*** of Clean Water	N/A (very significant)	N/A
Avoided Cost of Sewering	\$75,400,000	\$75,400,000 +
Total	\$135,572,100 (a conservative estimate due to large number of unquantifiable categories)	\$103,443,600 - \$204,426,100

NI = Not included. Although employment impacts clearly create jobs which provide a benefit to the Commonwealth, the appropriateness of considering these as a benefit is open to debate and they were not included in the lower bound estimate. It is important to note though, that *local benefits* which most economists would consider as appropriate to include in this analysis will almost certainly occur including the development of MA based companies to provide innovative and alternative treatment technologies that are saleable out-of-state and the "retention" of funds spent in MA for upgrades and inspections that would otherwise not have occurred; depending upon the apportionment of these costs between buyer and seller, a significant fraction of these monies would otherwise have left the Commonwealth to ultimately be spent elsewhere, due to people moving out of state.

NA = Data not available to allow for dollar values to be assigned to likely benefits. Thus, total benefits are highly conservative and significantly underestimate benefits.

¹ Average Yearly Rate. Due to uncertainties in temporal accrual of benefits, values were not discounted nor adjusted for inflation.

** Values rounded off to nearest \$100.

***Value placed by people on the existence of something of value even though they may not directly use it.

Because of its leadership status, Massachusetts is becoming a prime location for the development of these technologies. Massachusetts is developing plans for a technology testing and certification center, and encouraging the U.S. Environmental Protection Agency and other New England states to develop a region-wide uniform approval process. If the latter becomes a reality, alternative systems developed in Massachusetts could be certified for use elsewhere in the region without having to go through duplicative regulatory reviews. This will provide an important boost for the Massachusetts enviro-technology industry while providing more cost-effective choices for Massachusetts consumers.

Plumbing Board

An obstacle to the use of innovative technologies was overcome when DEP collaborated with the state plumbing board to revise sections of the plumbing code that previously had prohibited the use of many alternatives to conventional septic systems. David Del Porto of Sustainable Strategies, a company in the business of developing and marketing alternative systems, offers this assessment: "Harmonizing the requirements of Title 5 with those of the Board of Examiners of Plumbers and Gas Fitters has a far reaching impact for the future of pollution avoidance. It will ensure that these viable alternatives to conventional subsurface disposal technologies can be selected with confidence by home owners ... [and] enhance the credibility of these technologies and so encourage innovation through research and development here in Massachusetts."

TRAINING AND MUNICIPAL ASSISTANCE EASE THE TRANSITION

In 1995, DEP provided technical training to some 1,200 health board members, health agents and septic system designers. The agency also trained more than 3,500 system inspectors and some 1,000 soil evaluators. In early June, DEP established a toll-free hotline to provide information, help and referrals to homeowners, municipal officials, system inspectors and others with questions about Title 5 implementation. That hotline has served more than 5,300 callers to date.

In cooperation with the Executive Office of Communities and Development, DEP conducted eight training sessions for the 97 communities that have received grants under an initial \$10 million dollar Title 5 financial assistance program. These workshops taught local officials how to implement successful community betterment or loan programs for homeowners needing financial assistance with septic system repairs and upgrades.

Next year, training will be expanded to serve all Massachusetts towns and cities, and will include training on how to establish septage management districts. The Administration will also continue seeking additional financial assistance for municipal governments through the Open Space Bond Bill, which includes \$30 million to help homeowners pay for Title 5 repairs and upgrades.

SEWER FINANCING PLAYS A ROLE

In many cases, on-site wastewater treatment offers important economic and environmental advantages and is preferable over conventional sewer systems. In other cases, however, sewer systems are clearly the best alternative.

For example, many neighborhoods in Massachusetts are built in areas with ledge, high groundwater and poor soil conditions, not conducive for traditional septic systems. As a result, a large percentage of these homes have failing systems today. Municipal sewers are often the most cost-effective solution for the long term in neighborhoods like these, and the State Revolving Fund (SRF) provides towns and cities with subsidized loans to finance sewer construction. SRF loans supported \$15 million in municipal sewer projects during the last year. Another \$15 million in loans will be issued by the end of June 1996. These investments will eliminate the need to replace an estimated 1,900 failing or potentially failing Title 5 systems.

Efforts to protect the Wachusett Reservoir offer a prime example of how state financing can help. The Metropolitan District Commission estimates that half of the 11,000 septic systems in the Wachusett watershed are failing, posing a major threat to the drinking water supply for 2.1 million Bay State residents. Fifty-eight million dollars will be spent over the next six years to extend sewers in West Boylston and Holden. This is a key component of a larger strategy for Massachusetts to avoid the expense of building a federally-mandated \$400 million water filtration plant.

The SRF Trust is currently refinancing some of its existing projects to make an additional \$20 million available for priority sewer needs in neighborhoods where Title 5 systems are failing.

Also, DEP is developing a proposal that would expand the state's ability to use the financial resources of the SRF to address non-point sources of water pollution, such as failing Title 5 systems, with new management approaches and technological alternatives to conventional sewerage. The specifics of this regulatory change will be unveiled in January 1996, with public hearings to follow.

LEGISLATIVE SUPPORT IS CRUCIAL

Members of the Legislature, and particularly the Joint Committee on Natural Resources and Agriculture, have provided DEP with valuable assistance in identifying Title 5 implementation challenges. State lawmakers also have adopted changes to the betterment law and appropriated \$10 million, enabling many municipalities to help their citizens pay for septic system repairs.

Title 5 Encourages Alternative Technologies

- A homeowner in Haverhill was quoted a price of \$15,000 to replace his failed system. But that was under the old Title 5. Under the new rules, he was able to build a smaller leach field. Total installed cost: \$6,800, a savings of more than \$8,000.
- A single-family home in Needham had an existing cesspool, sitting in the groundwater and located only 21 feet from a lake, on a small lot with no room for a conventional system. Under the old rules, the only solution would have been a costly tight tank. But the new rules allowed the homeowner to install an innovative technology which solved the problem.
- More than 300 people attended an alternative technology workshop in western Massachusetts last September. The Tri-Town Health Department reports that since then, at least half a dozen homeowners in Lee, Lenox and Stockbridge have opted to install technological alternatives which cost less than conventional septic systems on their lots and work at least as well, if not better.

Continued support is needed to complete the successful implementation of this program. Specifically, the Legislature must enact the proposals submitted by the Administration in early August:

- House Bill 5393, to provide a \$2,500 tax credit to homeowners making repairs to comply with Title 5; and
- House Bill 5392, to establish a uniform statewide code for septic system repairs and upgrades.

In addition, passage of the Open Space Bond Bill is critical to provide an additional \$30 million dollars to supplement existing Title 5 loan programs and get them going in more cities and towns.

LOOKING TO THE FUTURE

Much progress has been made, but additional challenges still lie ahead.

- Systems that treat more than 10,000 gallons per day (gpd) must be inspected by December 1, 1996. Between now and then, DEP will develop an extensive outreach campaign to communicate with the owners of these large systems about the inspection requirements and how to comply. This will include a substantial effort to identify the hundreds of systems that fall into this category. Because DEP in the past did not issue permits for systems under 15,000 gpd, there is no existing database.
- In February 1996, DEP will release a computerized nitrogen loading model that can assess how proposed land uses within the zones of contribution to public water supply wells (Zone IIs) will affect nitrate concentrations in the drinking water. This will give communities a valuable tool for evaluating the impacts of development and zoning decisions on drinking water quality. And in some cases, its use may provide the information necessary to allow DEP to relax septic system density requirements.
- The Administration will continue to seek financial resources from the Legislature for assistance to municipal governments.
- DEP will continue to provide technical assistance to local governments. That assistance will help communities determine which treatment system, or combination of systems, make the most sense. DEP is particularly interested in helping communities develop long-term waste management programs.